

REMARKS

Claims 32-52 are pending in the application with claims 36, 44, and 49-51 amended herein and new claim 52 added herein.

Claims 36, 38, and 39 stand rejected under 35 U.S.C. 102(e) as being anticipated by Lee. Applicants request reconsideration.

Amended claim 36 sets forth a capacitor construction that includes, among other features, a first capacitor electrode, an insulative barrier layer to oxygen diffusion over the first electrode, a capacitor dielectric layer over the first electrode, and a second capacitor electrode over the dielectric layer and the barrier layer. The barrier layer includes a chemisorption product of first and second substantially saturated precursor monolayers. Page 3 of the Office Action alleges that Lee discloses the claimed chemisorption product. However, reference to column 4, line 63 to column 5, line 10 of Lee cited by the Office and the remainder of Lee does not reveal any disclosure of suggestion of a chemisorption product. At least page 8, line 10 to page 9, line 7 of the present specification discuss the difference between a reacted layer deposited by CVD and a chemisorbed layer such as claimed. It is clear from the express text of Lee that conventional CVD is the only deposition process contemplated for forming alumina layer 21. Lee does not disclose or suggest any deposition methods that could be considered to involve chemisorption instead of CVD reaction of feed materials.

Page 3 of the Office Action alleges that a first precursor monolayer is formed during a first stage of the CVD process and that a second precursor monolayer is formed during a second stage of the CVD process. It is clear from Lee that conventional CVD is used

wherein feed materials react in the gas phase to form alumina and then deposit as alumina on the substrate. Further, Lee states that alumina layer 21 formed during the first stage is subjected to a rapid thermal process for annealing and crystallizing layer 21 before additional alumina deposition in the second stage. Clearly, Lee does not contemplate that any chemisorption occurs between the annealed and crystallized alumina layer 21 formed during the first stage and the later deposited alumina layer of the second stage. Applicants assert that no chemisorption is disclosed in Lee and that the Office has not provided any basis in fact and/or technical reasoning to reasonably support the determination that chemisorption inherently occurs based on the teachings of Lee. At least for such reasons, Lee fails to disclose or suggest the claimed chemisorption product.

In addition, Applicants assert that Lee fails to disclose or suggest the claimed first and second precursor monolayers. Pages 6-8 of the present specification, especially page 6, lines 1-11, provide a detailed discussion of the term "monolayer." Claim 36 is required to be interpreted in light of the specification definition of terms used in such claim. Given the description in the present specification of how to accomplish forming a monolayer, it is clear that the conventional CVD process of Lee is not capable of forming any precursor monolayers. The mere statement in column 4, lines 63-66 of Lee that alumina layer 21 has a thickness of less than 20 Angstroms does not constitute disclosure or suggestion of a precursor monolayer. Further, no monolayer of any precursor is formed in the CVD process of Lee since any precursors or feed materials react in the gas phase to deposit alumina, not as a precursor, but as a reaction product. At least for such reason, Lee does not disclose or suggest the claimed first and second precursor monolayers.

Still further, Applicants assert that Lee does not disclose or suggest precursor monolayers that are substantially saturated, as claimed. Page 12, line 21 to page 13, line 9 support the amendment to claim 36 adding "substantially saturated." Pursuant to page 6, lines 7-11 of the present specification, a substantially saturated monolayer yields a deposited layer that exhibits the quality and/or properties desired for such layer. In claim 36, the chemisorption product of first and second substantially saturated precursor monolayers is set forth as a insulative barrier layer to oxygen diffusion. The chemisorption product is thus both insulative and an oxygen diffusion barrier. Review of Lee does not reveal any disclosure or suggestion of substantially saturated chemisorption products capable of providing the claimed features. At least for such reason, Lee fails to disclose or suggest substantially saturated precursor monolayers. Anticipation requires disclosure of each and every claim limitation. Lee fails to disclose several limitations of claim 36 and does not anticipate such claim.

Claims 38 and 39 depend from claim 36 and are not anticipated at least for such reason as well as for the additional limitations of such claims not disclosed. Applicants further assert that the Office Action does not allege and Lee does not support any finding that the limitations of claim 36 not disclosed by Lee are somehow suggested by the cited art. Accordingly, Applicants further assert that claims 36, 38, and 39 are patentable over Lee, considered alone or in combination with other cited references. Applicants request allowance of claims 36, 38, and 39 in the next Office Action.

Claims 32-35, 37, and 40-51 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lee. Applicants request reconsideration.

Claim 32 sets forth a capacitor construction that includes, among other features, an atomic layer deposited insulative barrier layer to oxygen diffusion between first and second capacitor electrodes. Pages 4-5 of the Office Action allege that the process limitation "atomic layer deposited" of claim 32 yields a product that is not patentable over the capacitor construction described in Lee, particularly alumina layer 21. Applicants note that alumina layer 21 is only disclosed in Lee as a product of CVD. In the present specification, page 6, line 1 to page 8, line 9 describe ALD and page 8, lines 5-9 expressly state that operation outside traditional temperature and pressure ranges of ALD risks formation of defective monolayers and, thus, defective insulative barrier layers. Page 11, lines 11-13 states that an important consideration for a barrier layer is the thickness and the density sufficient to reduce oxygen diffusion.

Page 8, line 10 to page 9, line 7 of the present specification contrast CVD with traditional ALD, explaining the inherent differences in the atomic and/or molecular structure and physical properties in comparison to ALD. Since CVD, including the Lee process, involves operation outside the traditional temperature and pressure ranges of ALD, a less desirable barrier layer inherently results from such processes. Thus, it is apparent that a physical difference exists between the claimed atomic layer deposited insulative barrier layer and alumina layer 21 described in Lee as formed by CVD. Applicants assert that Lee does not disclose or suggest any process capable of producing the inherent physical structure and properties of the claimed atomic layer deposited insulative barrier layer. An obviousness rejection requires disclosure or suggestion of every claim limitation in the cited art. Accordingly, claim 32 is patentable over Lee.

Applicants acknowledge the burden of showing a structural difference between the barrier layer product resulting from the claimed process limitation and the product described by Lee. Applicants assert that the burden has been met.

Claims 33-35 depend from claim 32 and are patentable at least for such reason. Claim 37 depends from claim 36 established herein as also patentable over Lee and is thus patentable at least by reason of such dependency. Claim 40 sets forth a memory array that includes, among other features, an atomic layer deposited insulative barrier layer to oxygen diffusion between first and second capacitor electrodes. As may be appreciated from the discussion herein regarding the deficiencies in Lee in suggesting every limitation of claim 32, claim 40 is also patentable over Lee.

Claims 41-44 depend from claim 40 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. For example, claim 44 sets forth that the barrier layer includes a chemisorption product of first and second substantially saturated precursor monolayers. As established herein with regard to claim 36, Lee fails to disclose or suggest a chemisorption product of first and second substantially saturated precursor monolayers, as also set forth in claim 44.


Claim 45 sets forth a plurality of memory dice, each die including an atomic layer deposited insulative barrier layer to oxygen diffusion between first and second capacitor electrodes. Claim 49 depends from claim 45 and sets forth that the barrier layer includes a chemisorption product of first and second substantially saturated precursor monolayers. As may be appreciated from the discussion herein regarding respective claims 40 and 44, claims 45 and 49 are also patentable.

Amended claim 50 depending from claim 44, amended claim 51 depending from claim 49, and new claim 52 depending from claim 36 set forth that the first and second precursors are different. Page 12, line 21 to page 13, line 9 of the present specification supports such limitation. Applicants assert that the cited art, including Lee, does not disclose or suggest the subject matter of amended claim 50, amended claim 51, and new claim 52. At least for such reasons, Applicants assert that claims 32-35, 37, and 40-52 are patentable over Lee.

Applicants herein establish adequate reasons supporting allowance of all pending claims 32-52 and request allowance of such claims in the next Office Action.

Respectfully submitted,

Dated: 03 Apr 2003

By: 
James E. Lake
Reg. No. 44,854